# UTHM
### Universiti Tun Hussein Onn Malaysia

# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## SEMESTER II
## SESSION 2014/2015

| | | |
|---|---|---|
| COURSE NAME | : | ELECTRONIC CIRCUIT THEORY |
| COURSE CODE | : | BEF 12603 |
| PROGRAMME | : | BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS |
| EXAMINATION DATE | : | JUNE 2015 / JULY 2015 |
| DURATION | : | 3 HOURS |
| INSTRUCTION | : | ANSWER ANY **FIVE (5)** QUESTIONS. |

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

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Q1   (a)   A semiconductor material can be doped with extrinsic impurities to create either an n-type or p-type semiconductor materials. Describe the difference between n-type and p-type semiconductor in respect to its majority and minority carriers.

(3 marks)

(b)   Describe in your own words and sketch a figure to explain the conditions established by forward-bias and reverse-bias on a p-n junction diode and how the resulting currents are affected.

(5 marks)

(c)   Analyze circuit in **Figure Q1(c)** carefully.

Calculate value of the following,

(i)     Voltage across $D_2$

(3 marks)

(ii)    Current $i_1$

(3 marks)

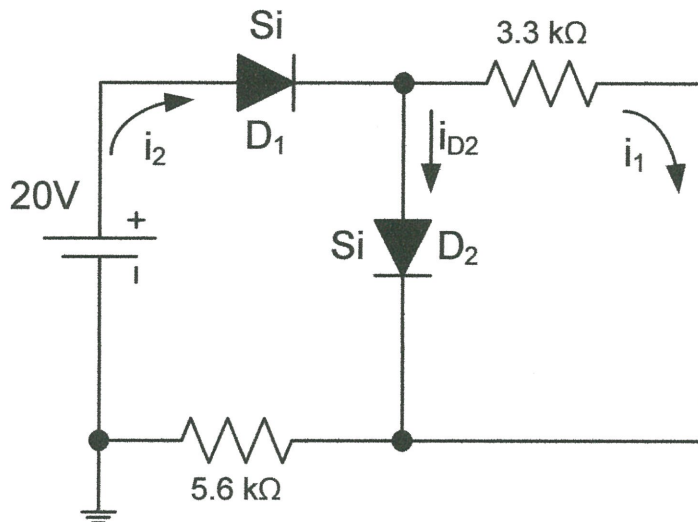(iii)   Current $i_2$

(3 marks)

(iv)    Current $i_3$

(3 marks)



**Figure Q1(c)**

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Q2  (a)  Sketch an I-V curve graph for a p-n junction diode and identify the forward-bias region, reverse-bias region and the breakdown voltage.

(4 marks)

(b)  Explain the operation of zener diode

(4 marks)

(c)  Analyze circuit in **Figure Q2 (c)** carefully.

Calculate the value of the following,

(i)  Current $i$

(3 marks)

(ii)  Voltage across 4.7 kΩ resistor, $V_1$

(3 marks)

(iii)  Voltage across 2.2 kΩ resistor, $V_2$

(3 marks)

(iv)  $V_O$

(3 marks)



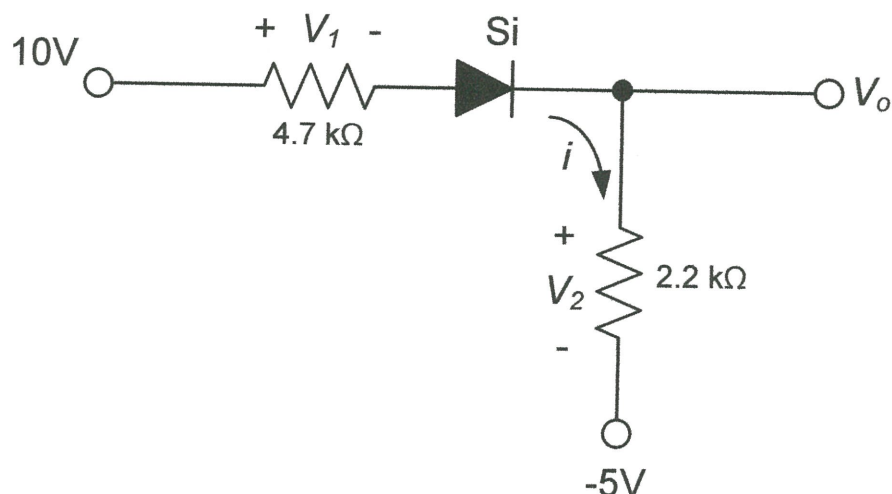**Figure Q2 (c)**

3

Q3 (a) A bipolar junction transistor (BJT) can operates in **three (3)** different mode operations. Explain these operations in respect to current flowing from emitter to collector.

(6 marks)

(b) Analyze circuit in **Figure Q3(b).** Calculate node voltage $V_B$, $V_C$, and $V_E$. (Assume $V_{BE} = 0.7V$)

(14 marks)



**Figure Q3 (b)**

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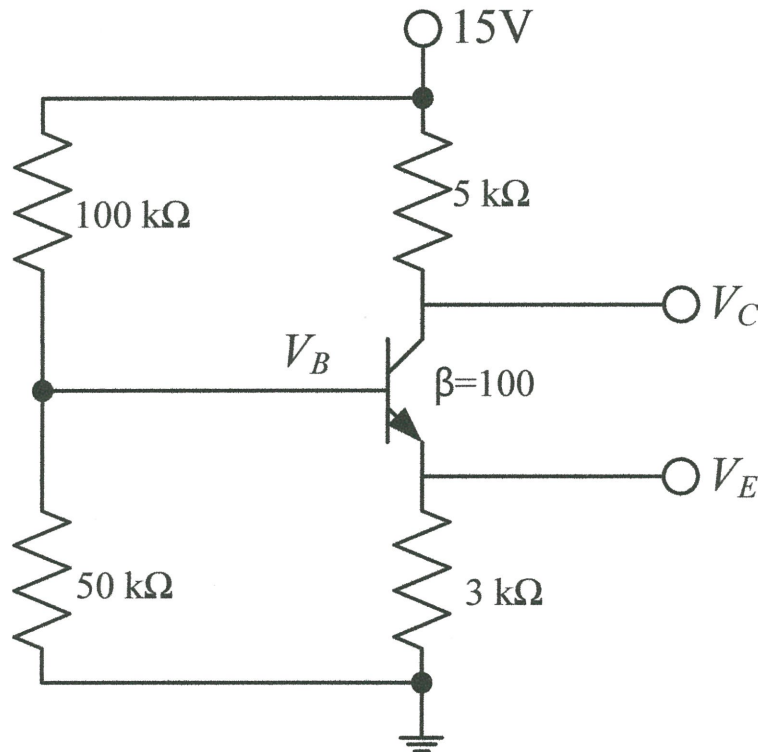
Q4  (a)  Explain what quiescent operating point (Q point) is. You may use figure to aid your explanation.

(5 marks)

(b)  Determine the quiescent levels of $I_{CQ}$ and $V_{CEQ}$ for circuit in **Figure Q4(b)** Assume $V_{BE} = 0.7$ V.
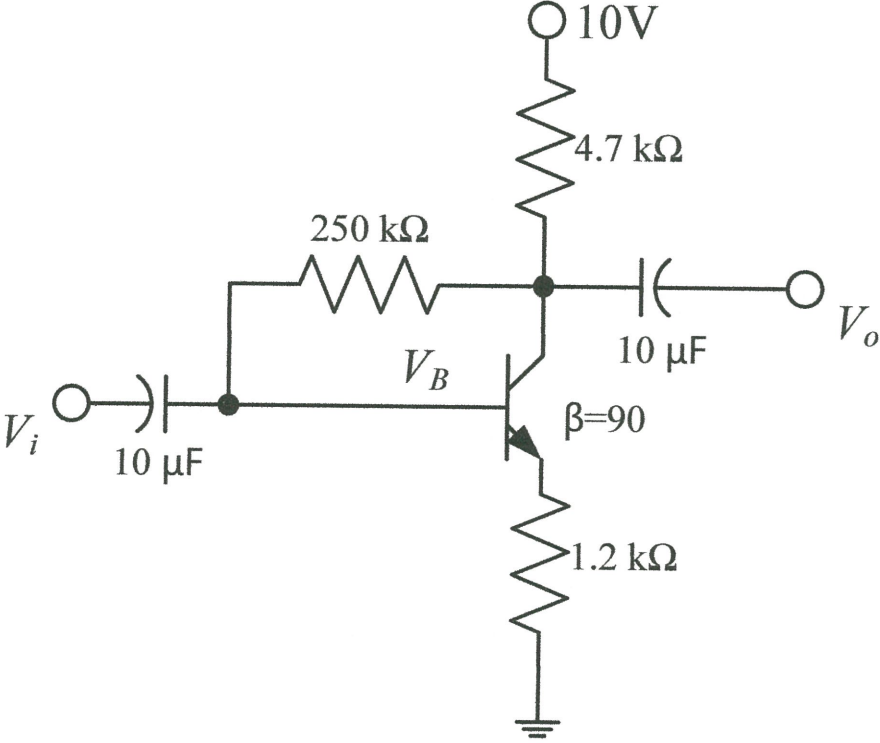
(15 marks)



**Figure Q4 (b)**

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Q5    (a)    Explain why BJT transistor biasing is important for AC amplification application.

(8 marks)

(b)    Analyze the circuit in Figure **Q5(b)**. Assume $V_{BE}$=0.7 V.

Define and calculate,

(i)    $r_e$

(3 marks)

(ii)    $Z_i$

(3 marks)
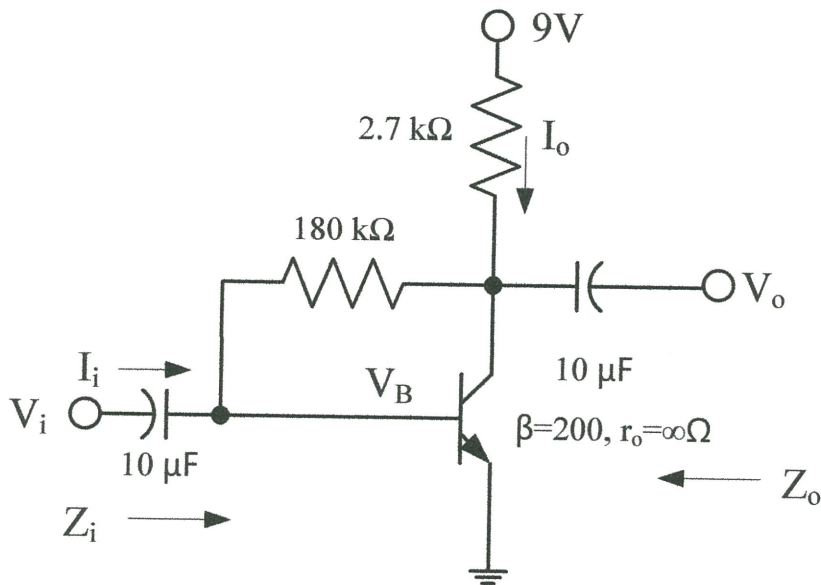
(iii)    $Z_O$

(3 marks)

(iv)    $A_V$

(3 marks)

**Figure Q5(b)**

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Q6    (a)    Sketch the basic construction of n-channel depletion type MOSFET. Labelled it accordingly.

(5 marks)

(b)    Sketch the basic construction of n-channel enhancement type MOSFET. Labelled it accordingly.

(5 marks)

(c)    Explain the significant difference between the depletion type and enhancement type MOSFET in term of construction and operation.

(10 marks)

Q7    (a)    Explain the classification of class A, class B, class AB, class C and class D power amplifier.

(10 marks)

(b)    Analyze circuit in **Figure Q7(b)**

Calculate:

(i)    The maximum input power

(2.5 marks)

(ii)    The maximum output power

(2.5 marks)

(iii)    The input voltage for maximum power operation

(2.5 marks)

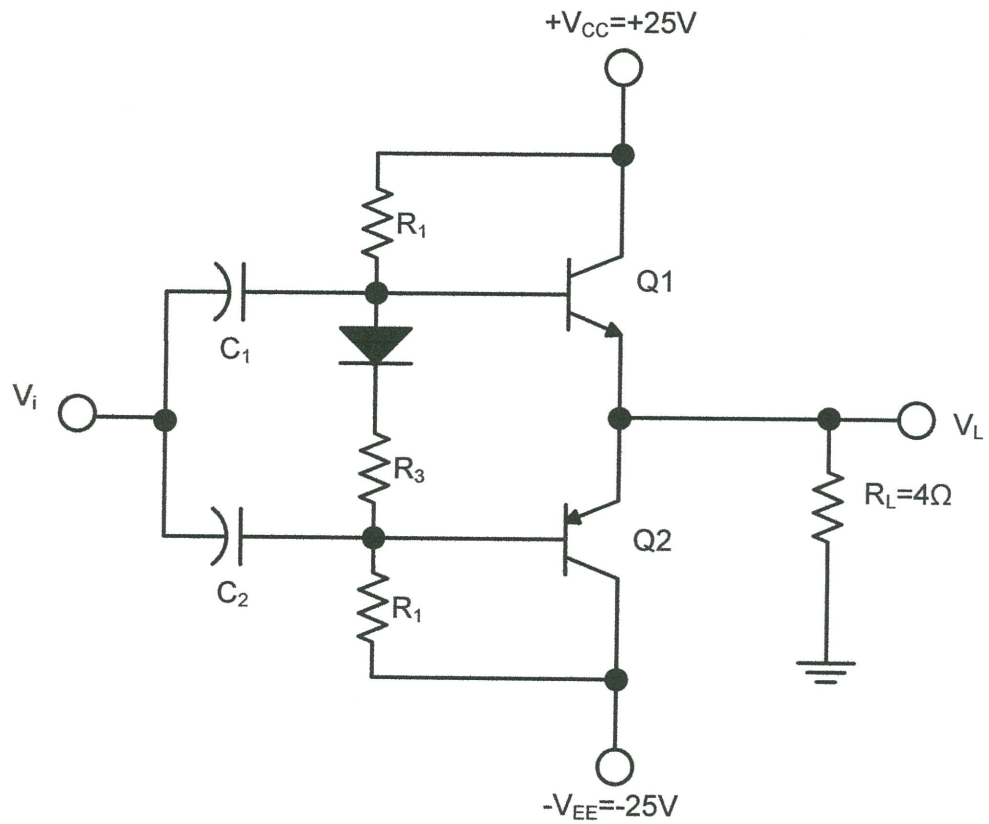(iv)    The power dissipated at maximum power operation

(2.5 marks)

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**Figure Q7(b)**

-END OF QUESTIONS-

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